ACS-PADLOCK-V2

Technical specifications

Object The aim of this document is to present the complete ACS-Padlock-V2 technical specifications. That includes the features descriptions, the commands supported, the complete set of parameters and the spontaneous frames format.



Summary

1 Main features	4
1.1 Behaviour	4
2 Configuration	5
2.1 Défault settings	5
2.2 Main configuration frame by LoRaWAN Downlink, NFD Command or blueto	ooth
command.	5
2.2.1 Perform a lock	5
2.2.2 Perform an unlock	5
2.2.3 Parameter changes	6
3 Spontaneous trames	/
3.1 Event trames	/
3.1.1 [UX68] – Short event frame Error: Bookmark not detil	nea.
3.1.2 [0x69] - Standard event frame	9
3.1.4 Event Type description table	10
3.1.4 Event type description tuble	11
3.2 1 [0x6C] - Short Keen alive frame	11
3.2.2 [0x6D] - Standard Keep-alive frame	15
3.2.2 [0x6F] = Special Keep-alive frame	16
3.3 Technical frames	10
3 3 1 [0x78] – Short Technical frame	17
4 Commands description	18
41 Generalities	18
4.2 Generic commands	
4.2.1 Generic commands list	18
4.2.2 Generic commands details	19
4.3 Applicative commands	29
4.3.1 Applicative commands list	29
4.4 Application commands	ned.
4.5 Application commands	30
4.5.1 Application commands details	30
5 Battery replacement and initialization	39
5.1 Battery replacement	39
5.2 Battery level initialization	41
6 Parameters description	42
6.1 APPLICATION parameters	42
6.1.1 General parameters	43
6.1.2 Events management parameters	45
6.1.3 Lock/Unlock/Seal parameters	48
6.1.4 Other parameters	50
6.2 GENERIC parameters default values	51
7 Appendix C: Internal Log Events	53
7.1 Event Log frame structure	53
7.2 LOG_EN description	53
7.3 Logged Event Types	53
8 Appendix G: Generic Zone Configuration parameters	58

Revisions

Version	Date	Contributor(s)	Changes			
1	09/06/2023	MDD	First release documentatio	of n	ACS-PADLOCK	technical

Compatible firmware

Firmware number	Minimum firmware version
0453	01.00.08

BRINGING SENSE TO WIRELESS Error! Use the Home tab to apply Sous-titre to the text that you want to appear here. Error! Use the Home tab to apply Titre 1 to the text that you want to appear here.

1 Main features



1.1 Behaviour

ACS-padlock can be LOCKed/UNLOCKed by BLUETOOTH, NFC, DOWNLINK LORAWAN, CLOVER-NET AND TAP COMMAND.

It can send alerts by LoRaWAN frames reporting if the cable is cut, if it is inserted or not and if the case is open.

It also sends Periodic Frames containing sensor status, battery level and various information depending on the use case.

2 Configuration

2.1 Default settings

LoRaWAN settings

LoRaWAN ClassALoRaWAN ModePublicActivationOTAAADRActiveDutyCycleInactiveTx Power14dB

Functional settings

Event frame format Keep alive period Technical period Standard Standard every 4h Standard every 72h

2.2 Main configuration frame by LoRaWAN Downlink, NFD command or bluetooth command

LoRaWAN downlinks commands are always on port #1

2.2.1 Perform a lock

If you want to perform a lock, you have to send this downlink to the device on port #1

```
Request:
34FF1234EEEEEE61FFFFFFF
```

You can see details about Request and Answer here

2.2.2 Perform an unlock

You can request an unlock :

```
Request:
35FF1234EEEEEE61FFFFFFF0000
```

You can see details about Request and Answer here

x ineo⋅sense

BRINGING SENSE TO WIRELESS Error! Use the Home tab to apply Sous-titre to the text that you want to appear here. Error! Use the Home tab to apply Titre 1 to the text that you want to appear here.

2.2.3 Parameter changes

Request: 0401220102

- 04 : Write parameter
- 01 : Number of parameter
- 22 : Parameter's name
- 01 : Parameter's length
- 02 : Data

Response: 8401220100

00 : Parameter write success

3 Spontaneous frames

All spontaneous frames are colored the same way to identify 2 different parts in the frame:



3.1 Event frames

REMINDER Allocated frame headers are 0x68, 0x69 and 0x6B. The first 2 will be used for respectively short, standard and long frame type. The third one is available for any other special event frame format. A device can support only some of these frame types, according to its specifications.

Event frame feature and sending mechanisms are described in the CloverCore Generic Specifications documents. Refer to [DR01].

Here below are described the Event frame formats generated by the device.

3.1.1 [0x68] – Short event frame

IMPORTANT Since EVT_DATA field can be 8 bytes long, this Short event frame format skip this data to allow sending the most imprtant information while keeping the standard Event frame format detailed in [DR01].

However, if all event data is required in a minimum of payload size, <u>Special Event frame</u> propose a custom format that only bring EVT_TYPE, EVT_INFO and EVT_DATA and skip the other generic fields.

Frame format

FH	STA	TUS	TEMP	EVT_TY PE	EVT_IN FO	ΟΤΟΤ	x_info
0	1	2	3	4	5	6.	7
0x68	MSB					MSB	LSB

STATUS...... Status of the device and basic frame counter:

- **b15-12** are a basic spontaneous frame counter that overlaps each 16 spontaneous frame generated. This is typically used to detect frame repetition on system level.
- **b11-0** are a copy of the same bits of parameter **DEV_STAT** (refer to [<u>DR01</u>] for details]

EVT_TYPE Enumeration of event types. See the Event Type description table below for the details.

- 0x80...Motion Event;
- 0x81...Shock Event;
- 0x82...Tilt Event;
- 0x83... Magnetic field change Event;
- 0x84...Temperature Event;
- 0x85...Reed Relay Event;
- 0x86... Open Case Event;
- 0x87...Zone Event;
- 0x90...Lock Event;
- 0x91... Unlock Event;
- 0x92...Cable Event;
- 0x93... Authorization Event;
- 0xB0..Command Reject Event (EVT_TYPE field is rejected command FH);
- 0xC0.. Authorization Request Event (EVT_TYPE field is requested command FH).
- OTOTx_info...... Time between the moment the frame is generated and the moment of sending [expressed in seconds] Occupies always the last 2 bytes in this type of frame

Thus, event calculated timestamp is: reception time - OTOTx delay

3.1.2 [0x69] – Standard event frame

NOTE Since EVT_DATA field can be 8 bytes long, this means that such a frame type can be 15 bytes long maximum. Thus, this is not suitable for Sigfox uplink (limited to 12 bytes). In Sigfox, use <u>Special Event frame</u> instead.

Frame format

FH	STA	TUS	TEMP	EVT_TYP E	EVT_INF O	EVT_DA TA	0101	x_info		
0	1	2	3	4	5					
0x69	MSB	LSB					MSB	LSB		
STATUSStatus of the device and basic frame counter:										
		b15-12 c frc le b11-0 ar	are a basio ame gene vel. re a copy	c spontan erated. Thi of the sam	eous fram is is typica ne bits of p	e counter Ily used to arameter	that over detect t DEV_STA	1aps each irame repe I (refer to [16 spontaneous etition on system DR01] for details]	
EVT_TYPE Enumeration of event types. See the <u>Event Type description table</u> below for the details.										
		0x80 M 0x81 Sh 0x82 Til 0x83 M 0x84 Te 0x85 Re 0x86 O 0x87 Zc 0x90 Lc 0x90 Lc 0x91 Ur 0x92 Cr 0x93 Ar 0x80 Cr	otion Eve nock Event t Event; agnetic fi mperatur eed Relay pen Case one Event; nock Event; nock Event; able Even uthorizatic	nt; eld chang re Event; Event; Event; Event; t; nt; nt; nt; Reject Event Reject Event;	ge Event; ent (EVT_T t Event (EV	YPE field is /T_TYPE fie	s rejected eld is requ	l command lested com	d FH); nmand FH).	
EVT_INFO Enumeration that split the event type into several of children. See the <u>Event Type</u> <u>description table</u> below.										
EVT_DATA		Data relo The size o	ated to th depends	e event. S on the eve	ee the <u>Ev</u> ent (detail	ent Type o in the <u>tak</u>	<u>descriptio</u> ble below	<u>n table</u> be).	low.	
OTOTx_inf	0	Time be [express Occupie Thus, eve	tween the ed in secc es always ent calcul	e momen onds] the last 2 l ated time	t the fram oytes in thi stamp is: 1	e is gene is type of t reception	rated an frame n time -	d the mor - OTOTx_d	nent of sending	



3.1.3 [0x6B] – Special Event frame

Frame format

FH	EVT_TYPE	EVT_INFO	EVT_DATA
0	1	2	
Ox6B			

- **EVT_TYPE**..... Enumeration of event types. See the <u>Event Type description table</u> below for the details.
 - 0x80...Motion Event;
 - 0x81....Shock Event;
 - 0x82...Tilt Event;
 - 0x83... Magnetic field change Event;
 - 0x84...Temperature Event;
 - 0x85...Reed Relay Event;
 - 0x86... Open Case Event;
 - 0x87...Zone Event;
 - 0x90...Lock Event;
 - 0x91...Unlock Event;
 - 0x92...Cable Event;
 - 0x93... Authorization Event;
 - 0xB0 .. Command Reject Event (EVT_TYPE field is rejected command FH);
 - 0xC0.. Authorization Request Event (EVT_TYPE field is requested command FH).
- EVT_INFO Enumeration that splits the event type into several of children. See the description table below.
- **EVT_DATA**..... Data related to the event. See the description table below. The size depends on the event (detail in the table below).

3.1.4 Event Type description table

This table presents the exhaustive list of events that the device can generate and send through the configured communication medium in parameter **EVT_MODE** (see [DR01] for more details about this generic parameter).

Each sub field in EVT_DATA is given its size in bytes.

NOTE The last column reminds the parameter and the bit in it to enable the corresponding event frame.

EVT_TYPE	EVT_INFO	Description		EVT_DATA		Enable bits PARAM [BIT]
	0x00	Motion Start.				EVT_SEND [MSTART]
0x80	0x01	Motion Continous.	SENS STAT (2B)	Z@ (4B)	-	EVT_SEND [MCONT]
	0x02	Motion Stop.				EVT SEND [MSTOP]
0x81	0x00	Shock detected (not supported).	SENS STAT (2B)	Z@ (4B)		EVT_SEND [SHOCK]
	0x00	Tilt detected.				EVT_SEND [TILT]
0x82	0x01	Tilt detected Continous (not supported).	SENS_STAT (2B)	Z@ (4B)		EVT_SEND [TILT]
	0x02	Tilt restored.				EVT_SEND [TILT]
	0x00	Magnetic field outside thresholds detected.				EVT_SEND [MAG]
0x83	0x01	Magnetic field outside thresholds detected Continous (not supported).	SENS_STAT (2B)	Z@ (4B)		EVT_SEND [MAG]
	0x02	Magnetic field return within thresholds.				EVT_SEND [MAG]
	0x00	Temperature below low threshold detected.				EVT_SEND [TEMP]
	0x01	Temperature above high threshold detected.	SENIS STAT	7@		EVT_SEND [TEMP]
0x84	0x02	Temperature outside thresholds detected Continous.	(2B)	(4B)		EVT_SEND [TEMP]
	0x03	Temperature return within threshold.				EVT_SEND [TEMP]
0~95	0x00	Reed Relay Stage 2 detected.	<u>SENS_STAT</u>	Z@		EVT_SEND [DI_RD2]
0205	0x01	Reed Relay Stuck.	(2B)	(4B)		EVT_SEND [DI_RD2]
0x86	0x00	Open Case detected	SENS_STAT (2B)	Z@ (4B)		Unconditional
	0x00	Zone enter.				EVT_SEND [ZENT]
	0x01	Zone exit.	SENIS STAT	7@		EVT_SEND [ZEXIT]
0x87	0x02	Zone no change.	(2B)	(4B)		EVT_SEND [ZCONT]
	0x03	Zone check info (answer of request for checking current location).				Unconditional
000	0x00	Adjustable Lock performed. Cable not present.	SENS STAT	Z@		EVT_SEND [LOCK] + LOCK_ECFG[ADJ_NCBL]
0X90	0x01	Adjustable Lock performed. Cable present.		(4B)	(2B)	EVT_SEND [LOCK] + Lock_ECFG[Adj_CBL]

CONFIDENTIAL – Do not distribute without prior written agreement

	0x02	Full Lock performed.				EVT_SEND [LOCK] + LOCK_ECFG[FULL_NCBL]
	0x03	Cable Already Locked in requested state. Lock operation not performed.				EVT SEND [LOCK] + LOCK ECFG[ALRD_LOCK]
	0x04	Auto Lock performed. Cable not present.				EVT_SEND [LOCK] + LOCK_ECFG[ALOCK]
	0x05	Auto Lock performed. Cable present.				EVT_SEND [LOCK] + LOCK_ECFG[ALOCK]
	0x06	Cable Not present when Lock is requested with Cable present. Lock operation rejected.				EVT_SEND [LOCK] + LOCK_ECFG[REJ_NCBL]
	0x07	Zon@ (Z@ applied in command) doesn't match requested. Lock operation rejected.				EVT_SEND [LOCK] + LOCK_ECFG[REJ_ZON]
	0x08	Zon ZIC (ZIC_LOCK parameter) doesn't match requested. Lock operation rejected.				EVT_SEND [LOCK] + LOCK_ECFG[REJ_ZON]
	0x09	Zoning before Lock requested, but Zone service not enabled. Lock operation rejected.				EVT_SEND [LOCK] + LOCK_ECFG[REJ_ZON]
	0x0A	Cable Cut. Lock operation rejected.				EVT_SEND [LOCK] + LOCK_ECFG[REJ_CBLID]
	OxOB	Lock failed. Locking state uncertain.				EVT_SEND [LOCK] + LOCK_ECFG[LOCK_FAIL]
	0x00	Unlock confirmed. Cable not present.				EVT_SEND [UNLOCK] + UNLOCK_ECFG[UL_NCBL]
	0x01	Unlock confirmed. Cable present.				EVT_SEND [UNLOCK] + UNLOCK_ECFG[UL_CBL]
	0x02	Already Unlocked. Cable not present.				EVT SEND [UNLOCK] + UNLOCK ECFG[ALRD_NCB L]
0x91	0x03	Already Unlocked. Cable present.	SENS_STAT	Z@	USER_ID	EVT_SEND [UNLOCK] + UNLOCK_ECFG[ALRD_CBL]
	0x04	Zon@ (Z@ applied in command) doesn't match requested. Unock operation rejected.	(2B)	(48)	(2B)	EVT_SEND [UNLOCK] + UNLOCK_ECFG[REJ_ZON]
	0x05	Zon ZIC (ZIC LOCK parameter) doesn't match requested. Unlock operation rejected.				EVT_SEND [UNLOCK] + UNLOCK_ECFG[REJ_ZON]
	0x06	Zoning before Unlock requested, but Zone service not enabled. Lock operation rejected.				EVT_SEND [UNLOCK] + UNLOCK_ECFG[REJ_ZON]
	0x07	Unlock failed. Locking state uncertain.				EVT_SEND [UNLOCK] + UNLOCK_ECFG [UL_FAIL]
	0x00	Cable inserted.				EVT_SEND [SEAL] + SEAL_ECFG [INS]
	0x01	Cable removed.				EVT SEND [SEAL] + SEAL_ECFG [REM]
0x92	0x02	Cable replaced.	SENS STAT	Z@	USER_ID (2B)	EVT_SEND [SEAL] + SEAL_ECFG [ID_ERR]
	0x03	Cable removed while device is Locked.	(ZD)	(4D)		Unconditional
	0x04	Cable cut (Cable ID can not be read) while device unlocked.				EVT_SEND [SEAL] + SEAL_ECFG [ID_ERR]
	0x05	Cable cut (Cable ID can not be read) while device locked.				Unconditional

CONFIDENTIAL – Do not distribute without prior written agreement

BRINGING SENSE TO WIRELESS Error! Use the Home tab to apply Sous-titre to the text that you want to appear here. Error! Use the Home tab to apply Titre 1 to the text that you want to appear here.

	0x06	New Cable ID		<u>SEAL ID</u> (8B)	EVT_SEND [SEAL] + SEAL_ECFG[ID_ERR]	
	0x00	Validity date expired. Operation rejected				EVT SEND [LOCK + AUTH ECFG[VDATE]
	0x01	Decription error. Operation rejected.			USER_ID	EVT SEND [LOCK + AUTH_ECFG[DEC]
0x93	0x02	Authorization request rejected. Operation rejected.	SENS STAT	FH (1B)		EVT_SEND [LOCK or UNLCOCK + AUTH_ECFG[AUTH_REJ]
	0x03	Authorization request accepted. Operation granted.			()	EVT_SEND [LOCK or UNLCOCK + AUTH_ECFG[AUTH]
	0x04 Authorization request answer timeout. Operation rejected.			EVT_SEND [LOCK or UNLOC + AUTH_ECFG[AUTH_REJ]		
	0x00	TAP start rejected. TAP process already running.				
	0x01	TAP start rejected. RTC invalid.				
0.04	0x02	TAP start rejected. Max. number tries reached.	<u>SENS_STAT</u> (2B)	Z@		EVT SEND [TAP]
UX94	0x03	TAP aborted. Timeout expire.		(4B)		
	0x04	TAP max. knocks on first digit exceeded.				
	0x05	TAP aborted because of parameter write.				
0x95	0x00	Generic parameter CN_PIN_CD changed.	SENS_STAT (2B)	New CN_PIN_CD		Unconditional
0×B0	Command command	Reject message (EVT_INFO field is rejected FH)	(FN(1B) +) STAT(1B)			Unconditional
0xC0	Authorizatic command	on Request (EVT_TYPE field is requested FH)	Comamnd that require authorization (max. 15B)			Unconditional
0xC8	EVT_TYPE which provoke this event	"Push" message (to send Tx queue in LoRaWAN or Sigfox)	SENS_STAT (2B)	Z@ (4B)		Unconditional

IMPORTANT: Events marked in red are send immediately after detected, without waiting on queue for Event frame sending!

EVT_INFO additional information:

- Bit 7 set (0x80) – This event is Alarm frame (see <u>Alarm management service</u> for details);

3.2 Keep-alive frames

REMINDER Allocated frame headers are 0x6C, 0x6D and 0x6F. The first 2 will be used for respectively short and standard type. The third one is available for any other special Keep-alive frame format. A device can support only some of these frame types, according to its specifications.

Keep-alive frame feature and sending mechanisms are described in the CloverCore Generic Specifications documents. Refer to [DR01].

3.2.1 [0x6C] – Short Keep-alive frame

Frame format

FH	STA	STATUS		SENS_	_STAT	EVT_	STAT	ΟΤΟΤ	x_info		
0	1	2	3	4	5	6	7	8	9		
0x6C	MSB	LSB		MSB	LSB	MSB	LSB	MSB	LSB		
STATUSStatus of the device and basic frame counter:											
b15-12 are a basic spontaneous frame counter that overlaps each 16 spontaneous frame generated. This is typically used to detect frame repetition on system level;											
b11-0 are a copy of the same bits of parameter DEV_STAT (refer to [DR01]).IEMPLast measured temperature form Clover-Sense sensor; Copy of application parameter <u>SENS_STAT</u> ;											
EVT_STAT Copy of application parameter <u>EVT_STAT</u> ; OTOTx_info Time between the moment the frame is generated and the moment of sending [expressed in seconds]. Occupies always the last 2 bytes in this type of frame											
	TI	nus, ever	nt calculo	ited time	stamp is:	receptio	n time –	OTOTx_d	elay.		

3.2.2 [0x6D] – Standard Keep-alive frame

Frame format

TEMP

FH	STATUS		TEMP	SENS_	SENS_STAT		EVT_STAT		x_info
0	1	2	3	4	5	67		8	9
0x6D	MSB	LSB		MSB	LSB	MSB	LSB	MSB	LSB

STATUS..... Status of the device and basic frame counter:

- **b15-12** are a basic spontaneous frame counter that overlaps each 16 spontaneous frame generated. This is typically used to detect frame repetition on system level;
- **b11-0** are a copy of the same bits of parameter **DEV_STAT** (refer to [<u>DR01</u>]).

Last measured temperature form Clover-Sense sensor;

SENS_STAT Copy of application parameter <u>SENS_STAT</u>;

EVT_STAT Copy of application parameter <u>EVT_STAT</u>; OTOTx_info Time between the moment the frame is generated and the moment of sending [expressed in seconds]. Occupies always the last 2 bytes in this type of frame.

Thus, event calculated timestamp is: reception time – OTOTx_delay.

3.2.3 [0x6F] – Special Keep-alive frame

Frame format

TEMP

FH	SENS_	_STAT	EVT_	STAT
0	4	5	6	7
0x6F	MSB	LSB	MSB	LSB

STATUS..... Status of the device and basic frame counter:

- b15-12 are a basic spontaneous frame counter that overlaps each 16 spontaneous frame generated. This is typically used to detect frame repetition on system level;
- **b11-0** are a copy of the same bits of parameter **DEV_STAT** (refer to [<u>DR01</u>]).

Last measured temperature form Clover-Sense sensor;

SENS_STAT Copy of application parameter <u>SENS_STAT</u>;

EVT_STAT Copy of application parameter **EVT_STAT**; **OTOTx info** Time between the moment the frame is generated and the moment of

sending [expressed in seconds]. Occupies always the last 2 bytes in this type of frame. Thus, event calculated timestamp is: reception time – OTOTx_delay.

3.3 Technical frames

REMINDER Allocated frame headers are 0x78. . A device can support only some of these frame types, according to its specifications.

Technical frame feature and sending mechanisms are described in the CloverCore Generic Specifications documents. Refer to [DR01].

NOTE Since any Technical frame type brings FW version, triggering on of these frame to the requester allow to get the FW version.

3.3.1 [0x78] – Short Technical frame

Frame format

4 Commands description

4.1 Generalities

Generic command frame headers are allocated from **0x01 to 0x33**.

By the way, special request frames are allocated from **0x34 to 0x67** (there will not be described here since they are closely linked to the application, and frame header are not imposed, just the range has to be considered).

4.2 Generic commands

4.2.1 Generic commands list

Frame header	Description
<u>0x00</u>	Trigger spontaneous frame
<u>0x01</u>	Read firmware version
<u>0x03</u>	Read parameters
<u>0x04</u>	Write parameters
<u>0×05</u>	Reset parameters
<u>0x07</u>	Read logs
<u>0x10</u>	Read RTC
<u>0x11</u>	Write RTC
<u>0x12</u>	Write RTC by delta
<u>0x17</u>	Launch installation process
<u>0x18</u>	Device integrity references initialization

4.2.2 Generic commands details

4.2.2.1 (0x00) - Trigger spontaneous frame

This command allows to force sending one of the spontaneous frame. The desired frame is given by FRAME parameter which correspond to its frame header (one of those specified in section <u>Spontaneous frames</u>.

TX_MODE permits the select the way of sending between the mode described in section <u>Communication</u> modes for spontaneous frames.

NOTE This command has no limitation: if we ask for sending a frame which is longer than the size supported by the requested *TX_MODE*, nothing will happen since it is impossible to send it, but the reply will be OK if the device knows the requested *FRAME*.

Requ	est format					
FH	FRAME	TX_MODE	DELAY MIN	DELAY MAX	CUSTOM_DATA	
0	1	2	3	4	5n	
0x00						
FRAME		. Frame heade	r of the spo	ontaneous	frame we want to trig	g a sending
TX_MOD	E	Mode used to If $0xFF \rightarrow thedefinition as E$	send the current o <u>VT MODE</u> ,	requested configurati <u>PP MODE</u>	frame on is used else, spe , <u>PDL MODE</u> , <u>PEL MC</u>	cify another mode (sc DE, <u>KA MODE, VS MOD</u>
DELAY M	IN & MAX	. Min and Max If both 0xFF, u	values in s ses the co	econds us	ed to set a random of values associated of	delay for sending the fro the frame type (FRAME)
CUSTOM	_DATA	Specify applic	cation date	a to send.	If left empty, applicat	ion will fill buffer.
Reply	format					
FH	STATUS					
0	1					
0x80						
STATUS		Request status 0x00 = Sendins 0xFF = Such a 0xFE = Such a	s: g will be pl frame is no tx mode is	rocessed ot supporte s not suppo	ed orted	

0xFD = Min delay must be lower or equal to max delay

0xFC = Frame triggering failed

4.2.2.2 (0x01) – Read firmware version

Firmware version reading request format

CMD	-
1 byte	-
0x01	

Firmware version reading answer format

ANS	APP_FW_NB	APP_FW_VER	RES_FW_NB	RES_FW_VER	BOOT_VER	REJ_OTA
1 byte	2 bytes	4 bytes	2 bytes	4 bytes	4 bytes	1 byte
0x81	Applicative fw number	Applicative fw version	Rescue fw number	Rescue fw version	Bootloader version	Rejected actions on firmware upgrade*

* Rejected Actions:

This filled was provided during the initialization of the RF service "firmware upgrade" (done automatically at the initialization of the product). It is used to inform the RF service "firmware upgrade" to reject some firmware upgrade session. Most of time when encryption is required on application, none crypt messages are all rejected to prevent attacks.

- b5...... A Bootloader firmware upgrade will be rejected
- b4...... A Rescue firmware upgrade will be rejected
- b3...... A continue of the previous session (session in timeout) will be rejected
- b2...... A firmware downgrade will be rejected
- b1...... on Firmware reboot the EEPROM erasing will be rejected
- b0...... A none crypt firmware upgrade session will be rejected

4.2.2.3 (0x03) - Read parameters

Request format

0 1 2 3 [1B] [1	
	B]
0x03	

NB_PARAM...... Number of parameters to be read

P1_ID..... ID of parameter 1 to read (same for Pn_ID)

P1_SIZE Size of the parameter 1 to read (same for Pn_SIZE)

Reply format

FH	NB_PARAM	P1_ID	P1_SIZE	P1_VALUE		Pn_ID*	Pn_SIZE*	Pn_VALUE*
0	1	2	3	[mB]		[1B]	[1B]	[OB]
0x83			m				0	
NB_PARA P1_ID	AM	Number of p ID of param	oarameters i eter 1 read	read (same for Pr	1_ID)			
P1_SIZE		Size of the p	arameter 1	read (same	for F	n_SIZE)		
P1_VALU	E	Value of the	parameter	1 read				

NOTE In case of request format error, reply will be 8300FF.



4.2.2.4 (0x04) – Write parameters

Request format

FH	NB_PARAM	P1_ID	P1-SIZE	P1_VALUE	*	Pn_ID *	Pn_SIZE*	Pn_VALUE
0	1	2	3	[mB]		[1B]	[1B]	[OB]
0x04			m				0	
NB_PAR	AM	Number of	parameters	to be write				
P1_ID		ID of param	neter 1 to w	rite (same fo	or Pn_II)		
P1_SIZE		Size of the p	oarameter [:]	I to write (sc	ame fo	r Pn_SIZE)		
P1_VAL	UE	Value of the	e paramete	er 1 write				

Reply format

FH	NB_PARAM	P1_ID	P1_STATUS		Pn_ID*	Pn_STATUS*
0	1	2	3		[1B]	[1B]
0x84						
NB_PAR	AM	Number of p	parameters	writte	ən	
P1_ID		ID of param	eter 1 writte	n (sc	me for Pn_II	D)
P1_STATI	JS	Writing statu 00 = Writing FF = Writing	is same for F success error (see no	n_SI ote b	ZE): pelow)	

NOTE	In case of	[,] param	informatio	n error,	its reply	will be	<pn< th=""><th>ID>FF and</th><th><pn_value></pn_value></th><th>will be</th></pn<>	ID>FF and	<pn_value></pn_value>	will be
	missing.									

4.2.2.5 (0x04) – Write parameters by bit mask

NOTE The frame header is the same as for the standard Write appli parameter command. The difference is that most significant bit in the parameter size is set to one. In such a case, this allows to insert the bit mask between this size and the param value.

Request format

FH	NB_PARAM	P1_ID	P1-SIZE	P1_MASK	P1_VALUE		Pn_ID *	Pn_SIZE*	Pn_PASK*	Pn_VALUE
0	1	2	3	[mB]	[mB]		[1B]	[1B]	[OB]	[OB]
0x04			m with b7 set to 1					o with b7 set to 1		
NB_PAR	RAM	. Number	of parame	ters to be v	vrite					
P1_ID	•••••	. ID of pai	rameter 1 t	o write (san	ne for Pn_ID)				
P1_SIZE		. Size of th 0x81 for	ne paramet 1 byte long	ter 1 to write 1, 0x82 for 2	e (same for 1 bytes long	Pn_S:	ize) 0x8	0		
P1_MAS	SK	. Bit mask paramte	over the er accordin	parameter. g to the co	. Only the b rrepsonding	pits m P1_1	asked at VALUE bits	1 will be	updated in th	ıe
P1_VAL	UE	. Value of	the param	neter 1 write	9					

Reply format

FH	NB_PARAM	P1_ID	P1_STATUS		Pn_ID*	Pn_STATUS*			
0	1	2	3		[1B]	[1B]			
0x84									
NB_PARAMNumber of parameters written									
P1_ID		ID of param	eter 1 writte	n (sc	ame for Pn_1	ED)			
P1_STATUS									

NOTE	In case	of parar	n information	error, it	s reply	will be	<pn_< th=""><th>ID>FF and</th><th><pn_value></pn_value></th><th>will be</th></pn_<>	ID>FF and	<pn_value></pn_value>	will be
	missing.									

NOTE Standard param writing and bit mask writing can be merge in a single Write appli param command, depending on the b7 of each param size field.

4.2.2.1 (0x05) – Reset parameters

Request format

FH	LIST	TABLE	TYPE					
0	1	2	3					
0x05								
LIST		List of parar b1 Appli b0 Gene	meters to re ication pare eric parame					
TABLE	BLEDefault table ID to use (0x00 = First table). Only used for application parameter							
ТҮРЕ		Type of par 0x00Conf elseConf	ameters to iguration a iguration po					

Reply format

FH	STATUS
0	1
0x85	

STATUS	Request status:	
	0x00 = Reinitialization processed	
	0xFF = Request format error	
	0xFE = Error on all param reinit	
0xFD = Error on generic param re		
	0xFC = Error on application param reinit	

4.2.2.2 (0x07) - Read event datalogging

Request format

FH	T_INDEX	MODE	START_	ID	NU	JM
0	1	2	3	6	7	8
0x07			MSB	LSB	MSB	LSB

T_INDEX	 Table	index	k, it	has	to	correpsond	to	an	event	datalogging	table,	otherwise	the
	reque	st will	be	rejec	teo	d.							

- MODE......Defines theway of reading Log records (records are inserted in answer always starting from oldest one):
 - 0x00...Read the requested number of events starting from the most recent one, toward the oldest one. Field START_ID is not taken in account when MODE = 0x00.

If field NUM = 0, all valid records (which can fit in multiframe answer) are returned.

0x01...Read the requested number of events starting from the oldest one, toward the most recent one. Field START_ID is not taken in account when MODE = 0x01.

If field NUM = 0, all valid records (which can fit in multiframe answer) are returned.

0x02...Read the unread log records (pointed by **###** parameter). The ecords are always read starting from oldest unread event, toward the most recent one. Field START_ID is not taken in account when MODE = 0x02. After reading, ### parameter is updated (decreased) with number of read records.

If field NUM = 0, all valid records (which can fit in multiframe answer) are returned.

0x03... Read the log records starting from the record number pointed by START_ID. Records are always read starting from pointed by START_ID, toward recent one.

If field E_NUM = 0, all records starting from pointed by START_ID, toward recent one (which can fit in multiframe answer) are returned.

START_ID.....Index of the first evnet record in the table to start from (toward the most recent one). It is taken in account only when MODE = 0x03.

NUM.....Number of records to be read. If NUM = 0, all valid records (which can fit in multiframe answer) are returned.

Reply format

FH	STA	RT_ID	STATUS	IS REC_SIZE		JM	REC1			RECn	
0	1	4	5	6	7	10	11	x		у	z
0x87	MSB	LSB			MSB	LSB	MSB	LSB		MSB	LSB
START_I	TART_IDIndex of first event included in the answer (this is the oldest event)										
STATUSBit field defining type of log table:											
		b2	2 If set even not re	some ever ts than nun ead), else tl	nts were nber of here are	lost bef events v e no lost	ore read vhich co events.	d (could an fit in m	hap iax.	pen if ł multifrc	nigher nun Ime answe
b1If set every log record contains time stamp (first 4 bytes) on the moment c storing;											
b0If set this table is Periodic, else it is Normal.											

REC_SIZE Record size in bytes.

RECn Event record field (depends on device specifications

Reply format in case of error.

If the request syntax is not correct (table type is periodic, frame request size is wrong, not valid table index, wrong starting log number, etc..), le reply format is the following:

FH	STATUS
0	1
0x87	

STATUS..... Bit field defining type of log table: ####

4.2.2.3 (0x10) - Read RTC

Request format

FH	
0	
0x10	

Reply format

FH	RTC				
0	1 4				
0x90	MSB		LSB		

RTC..... Current device RTC (in number of seconds since 01/01/2010)

4.2.2.4 (0x11) - Write RTC

Request format

FH	VALUE							
0	1 4							
0x11	MSB		LSB					

VALUE New device RTC (in number of seconds since 01/01/2010)

Reply format

FH	STATUS
0	
0x91	

STATUS...... 0x00 : RTC update success 0xFF : RTC update failed

4.2.2.1 (0x12) - Write RTC by delta

Request format

FH		VALUE	
0	1		4
0x12	MSB		LSB

VALUE signed value, number of seconds used to add to RTC



Reply format

FH	STATUS
0	
0x92	

STATUS...... 0x00 : RTC update success 0xFF : RTC update failed

4.2.2.2 (0x17) – Launch installation process

NOTE This request can be sent only by Clover-Net.

Receiving this frame has the same effect as we have installation request by reed/button.

Request format

FH	MODE	PER	NB
0	14	56	7
0x17			
MODE.		"INST MODE"	parameter vo
PER		"INST_PER" pc	arameter value
NB		"INST_NB" par	ameter value

NOTE In current version, only one attempt is executed so PER and NB parameters are not managed.

Immediate Reply format

FR TIPE STATUS
0 1 2
0x97 0x00

STATUS.....Installation launching status: 0x00: Installation ongoing 0xFF: Error in frame format

Following Reply format

FH	TYPE	STATUS	DEV_STAT
0	1	2	34
0x97	0x01		

STATUS..... Installation status:

0x00: Installation finished, network required connected 0xFF: Installation finished, at least one required network not connected

DEV_STAT	See definition of parameter <u>DEV_STAT</u>
----------	---

4.2.2.3 (0x18) – Device integrity references initialization

This request is used to force a references (re)initialization in device integrity feature. This will affect TILT and/or MAGNETIC references depending on features enabled and chip embedded.

Request format

FH	-
0	
0x18	

Reply format

FH	STATUS
0	1
0x98	

STATUS...... Reference initialization launching status: 0x00: Reference initialization ongoing 0xFF: Error in configuration of device

4.3 Applicative commands

4.3.1 Applicative commands list

Frame header	Description
<u>0x34</u>	Lock command
<u>0x35</u>	Unlock command
<u>0x36</u>	Authorization answer command
<u>0x37</u>	New cable association command
<u>0x38</u>	Check Zone command
<u>0x39</u>	Check zone RSSI command
<u>0x2F</u>	Zone beacon incoming Message

4.4 Application commands

4.4.1 Application commands details

4.4.1.1 (0x34) – Lock command

In Clover-Net, Lock command has specific treatment due to time constraints on modem side (same sequence for Bluetooth as well):

- 1. Immediately after receiving command, answer is sent just to inform Host that the command is accepted.
- 2. After Locking process finished (successfully or not), event is sent to inform Host about result of operation.
- 3. Additional event is sent when cable is attached after locking.

In LoRaWAN/Sigfox (when the request is received through such a communication medium) as a downlink message), immediate answer is not sent. The result of the request is reported by event only after Locking process finishes. **LOCK_STAT** field in it includes all possible lock status except 0x00. Additional unsolicited event is sent when Cable was attached after Locking finishes.

In NFC interface only final result of locking is returned to NFC reader (it doesn't replace <u>Event frames</u> on final result).

However, additional event after Lock operation finishes are not reported to NFC (NFC doesn't accept unsolicited frames after NFC session is finished) – i.e. event Cable attached after lock, Auto Lock with, or without cable can't be reported on NFC.

When lock with **Z@** field set to valid (different from 0 or 0xFF...F), zone detection is performed before locking (it can take up to 30 seconds!).

Request format

FH	FN	USE	R_ID		V_DATE		CMD_ID		Z@			
0	1	2	3	4		7	8	9		12		
0x34		MSB	LSB	MSB		LSB		MSB		LSB		
FN		Fra	me Nur	nber;								
USER_ID		Use	er Identi	ficatior	Number	;						
V_DATE.	/_DATE											
CMD_ID		Iyp b7. b6. b5. b4. b3:	e of red Aut LED Incr Unc peri 0 Type 0x00 0x00	norization indication eased formed formed e of Lock Lock	d locking: on require tion requir Motor Sta nal Lock (); ck; ck; ck f cable i c no matte	ed. red; rt Force check s prese er if cak	e; for device Alr nt; ple is present.	eady Lo	ocked be	fore exe		
Z@		De Z@ 0x0 0xF An	fines re field fro 0000000 acc FFFFFFF in a y other dev	ceived om com 0 – No 2 count; – No 2 ccount – Trea ice is in	Zone add mand ha Zone add one addre ; ted as va area cov	dress, u is priorit ress res ess restri alid Zor vered b	nder which o y over setting triction on lock iction on lock he beacon c by this Zone.	only rea g in <u>ZIC</u> cking. <u>ZI</u> ing. <u>ZIC</u> iddress.	uested o <u>LOCK</u> pa <u>C LOCK</u> se <u>C LOCK</u> se	peration rameter settings a ettings ar is exec		

BRINGING SENSE TO WIRELESS Error! Use the Home tab to apply Sous-titre to the text that you want to appear here. Error! Use the Home tab to apply Titre 1 to the text that you want to appear here.

Reply format

	FH	FN	USER	_ID		RTC			EVT_NB		LOCK_STAT
	0	1	2	3	4		7	8		11	12
	0xB4		MSB	LSB	MSB		LSB	MSB		LSB	<mark>0x01-0x05 or 0x0</mark> 7-0x09
FN			Frame 1	Jumbe	er (the se	ame a	s in re	quest fro	ame);		
USER	D		User Ide	entifica	tion Nu	mber (the so	ame as i	n reque	st frame	e);
RTC			absolut	e seco	nds cou	, unter (s	ince	01.01.20	10) at n	noment	of locking;
EVT_N	В	•••••	Counte <mark>Appene</mark>	r value <mark>dix 5</mark>);	e of sto	ored ir	n ELT	event,	when r	equeste	ed action was done (see
LOCK	_STAT		Status c	ofexec	uting La	ock coi	mma	nd;			
			0x01 ⁽¹) Alree	ady Loc	cked, L	ock c	peratio	n is not	execute	ed. Lock Result frame is not
				sent	. <mark>If devi</mark> suted a	ce is in nd stat	<mark>⊢adju</mark> ture Ox	<mark>stable s</mark> i 07 is roti	<mark>ate an</mark>	<mark>d full loc</mark>	ck is requested operation is
			$0 \times 02^{(1)}$) Valia	suiea a dity dat	na sia e expir	ed lu	u/ is reie	inea ; sted la	ock Resi	Ilt frame is not sent:
			0x03 ⁽¹	⁾ Zoni	ng befo	ore Loc	k rea	uested,	but Zor	ne servic	ce disabled. Lock rejected.
				Lock	Result	frame	is not	sent;			,
			0x04 ⁽¹) Cab	le not p	present	, Loc	k rejecte	ed (this s	status c	an be received/sent only if
			0205(1		WITH CO	able pro	esent	is reque	sted). L Posult f	ock Res	sult frame is not sent;
			0x03(* 0x07(2		ina in r	roares	s. Wa	it.	Keson I		
				Lock	Result	frame	is will	be sent	on lock	manag	gement finish;
			0x08 ⁽²	⁾ Rem	iote Au	thoriza	tion e	xpected	d, Wait.		
			0,000		(Result	frame	will be	e sent o	n lock m	nanage	ment finish.
			UXU912		Result	frame	will be	, wan. e sent o	n lock m	nanaae	ment finish.
			Ste	ates po	osted at	ter Loc	ck op	eration f	inish (or	nly to Blu	Jetooth and NFC)
			0x00 ⁽³	Dev	ce four	nd alre	ady L	ocked,	Cable is	inserte	d;
			0x01 ⁽³) Dev	ce four	nd alre	ady L	ocked,	Cable is	s not ins	erted;
			0x06 ⁽³) Lock	(failed	. Lock :	State	not con	firmed;	o lo firmo o	d Calala inserts du
					r finishe	d succ	essiui essiui	ly Lock	sidie Co State co	onlime	d. Cable inserted; d. Cable is not inserted:
			OxOF ⁽³⁾	Lock	rejecte	ed. Zor	ning re	equeste	d but ZI	C doesr	n't match requested;
			0x10 ⁽³) Lock	rejecte	ed. Zor	ning re	queste	d but Z@	doesn	't match requested;
			(1) _ S S (2) _ Se t (3) _ Se	ent as igfox, t ent as fr his ans ent as s	frame his answ ame ar wer is no pontan	answe ver is se nswer ir ot sent, eous fr	er in C ent as n Clov ; ame	CloverNe s event; verNet a in Bluetc	et, Bluet nd Bluet both and	tooth a tooth. Ir d NFC ir	nd NFC. In LoRaWAN and LoRaWAN, Sigfox and NFC addition to Event sending;
Frr	or forma	,									
LIN					_						
	FH	FN	ST	ATUS							
	0 0xB4	1		2							
FN			Сору о	f reque	est FN fie	eld;					

STAT..... Error Status of request:

- 0xF1 Bluetooth management disabled by <u>SFN_EN</u>. BLE request rejected;
- 0xFC Frame Number Error;
- 0xFD Lock operation disabled;
- 0xFE Other Lock/Unlock command management in progress (wait until pending command management finish);
- 0xFF Wrong format or size.



4.4.1.2 (0x35) – Unlock command

In Clover-Net, Unlock command has specific treatment due to time constraints on modem side (same sequence for Bluetooth as well):

- 4. Immediately after receiving command, answer is sent just to inform Host that the command is accepted.
- 5. After Locking process finished (successfully or not), event is sent to inform Host about result of operation.
- 6. Additional event is sent when cable is detached after unlocking.

In LoRaWAN/Sigfox (when the request is received through such a communication medium) as a downlink message), immediate answer is not sent. The result of the request is reported by event only after Unlocking process finishes. **UNLOCK_STAT** field in it includes all possible unlock status except 0x08. Additional unsolicited event is sent when Cable was detached after Unlocking finishes.

In NFC interface only final result of unlocking is returned to NFC reader (it doesn't replace Event frames on final result).

However, additional event after Unlock operation finishes are not reported to NFC (NFC doesn't accept unsolicited frames after NFC session is finished) – i.e. event Cable detached after unlock can't be reported on NFC.

When unlock with **Z@** field set to valid (different from 0 or 0xFF...F), zone detection is performed before unlocking (it can take up to 30 seconds!).

Request format

FH	FN	USEF	lD		V_DATE		CMD_ID		Z@		ALOC	K_TIME
0	1	2	3	4		7	8	9		12	13	14
0x35		MSB	LSB	MSB		LSB		MSB		LSB	MSB	LSB
FN			Frame	e Numk	ber;							
USER ID.			User I	dentific	ation N	lumbe	ər;					
V DATE.			Validi	tv date	- date	up ta	which this	commo	and co	uld be	accept	ted:
			Type	, of requ	ested		r.				[-	-
			b6 b5 b4 b3:0	. LED in . Increc . Uncor is not (. Type c 0x00	dicatio used Mo ndition perform of Lock; Immed	n requ otor St al Unic ned); ; diate l	uired; art Force; ock (check Jnlock	for dev	ice Alre	eady U	nlockec	d before
Z@			Define Z@ fie 0x000 0xFFFI Any (es rece Id from 00000 - accou FFFF - in acc other - device	ived Za comm - No Zo unt; No Zon count; Treate e is in a	one a land h ne ac e adc d as rea c	ddress, un nas priority Idress restri dress restric valid Zone overed by	der which over set iction or tion on I e beaco this Zon	ch only ting in <u>i</u> locking ocking on addr e.	reque <u>ZIC LO</u> g. <u>ZIC Lo</u> . <u>ZIC Lo</u> ress. Re	ested op <u>CK</u> parce <u>LOCK</u> set <u>OCK</u> set equest i	eration i ameter: ettings ar tings are s execut
ALOCK_	TIME		Auto Time remo time s	Lock tir for Auto ved, 5 still not o	ne (in r blockin (<mark>10?</mark>) se expired	nultipl g dev econo I. If set	le of 2 seco vice after u ds after ren t to 0 or 0x1	onds). Unlock (v moval, d FFFF auto	when c autoloc olock is	able is king is disabl	s not rer applied ed.	noved). d even i

	FH	FN	USE	R_ID		RTC			EVT_NB		LOCK_STAT
	0	1	2	3	4		7	8		11	12
	0xB5		MSB	LSB	MSB		LSB	MSB		LSB	0x01-0x03 or 0x07
•N			. Frame	Numb	er (the s	same as	in req	uest fro	ame);		
JSER	ID		. User Ic	dentifico	ation Nu	umber (†	he sar	ne as ir	n reques	t fram	e);
- TC			. absolu	ute seco	onds co	, ounter (si	ince 0	1.01.20	' 10) at m	omen	t of lockina:
VT N	B		Count	er valı	le of st	fored in	FITe	event v	when re	auest	ed action was d
			Appel	ndix 5);			221 0			90051	
OCK_	_ STAT		. Status	ofexed	cuting L	ock cor	nmana	d;			
0x01 ⁽¹⁾ Already Unlocked,;											
0x02 ⁽¹⁾ Validity date expired, Unlock rejected. Unlock Result frame is not sent;											
			0x03(1)	Zoning	before	Unlock	reques	sted, bu	ut Zone	service	e disabled. Unlock
	Unlock Result frame is not sent;										
0x07 ⁽²⁾ Unlocking in progress, Wait (only in Clover-Net/ <mark>Bluetooth</mark>).											
				Unlock	Result	frame is	will be	sent o	n unlock	(man	agement finish;
			0x08 ⁽²⁾	Remot	e Autho	prization	expec	ted, W	ait.		
			0.00(2)	Unlock		frame w	ill be se	ent on	UNIOCK r	nanag	gement tinish.
			0x09(2)	Zone C	Deck In	n progre	ss, Wai ill bo si	t. ont on	unlockr	nanac	nomant finish
			S	tates pr	sted at	ftor Unio		erration	finish (o	nunuç niv to	Bluetooth and NEC
			0×00		vice fou	ind alrea	ndv Un		I Cable	is insa	rted.
			0x00	(3) Dev	vice fou	ind alrea	ndy Un		, Cable	is not	inserted.
			0x06	(3) Unl	nce iou nck faile	ed Unic	ocked	State n	ot confi	rmed.	inseried,
				(³⁾ Unl	ock finis	hed suc	cessfu		k State (confirr	ned Cable inserte
			0x0B	⁽³⁾ Unl	ock finis	hed suc	cessfu	lly Loc	k State (confirm	ned. Cable is not ir
			0x0F	⁽³⁾ Unl	ock reie	ected. 7	onina r	equest	ed but 7	IC do	esn't match reque
			0x10	⁽³⁾ Unl	ock reie	ected. 70	onina r	equest	ed but 7	'@ doe	esn't match reque
			0,110	0	0 0 1 1 0] 0	0100.12		99999			
			(1) _	Sent a	s frame	answe	r in Cl	overNe	t Blueto	ooth c	and NFC In LoRay
				Siafox.	this ans	wer is se	ent as e	event:	., Bioen		
			(2) _ ;	Sent as	frame of	answer (Clover	Net an	d Blueto	oth. Ir	LoRaWAN, Siafox
			·	this an	swer is r	not sent					
			(3) _ (Sent as	spontai	neous fro	ame in	Blueto	oth and	NFC i	n addition to Eveni

If Unlock command was not rejected (**UNLOCK_STAT** = 0x07) or answered with UN**LOCK_STAT**=0x01, after unlock command is executed spontaneous Unlock Result frame is sent to inform Unlock issuer about result of unlocking (see spontaneous Unlock Result Frame).

Error format

FH	FN	STATUS
0	1	2
OxB5		

FN..... Copy of request FN field;

STAT..... Error Status of request:

0xF1 – Bluetooth management disabled by <u>SFN_EN</u>. BLE request rejected;

- 0xFC Frame Number Error;
- 0xFD Unlock operation disabled;
- 0xFE Other Lock/Unlock command management in progress (wait until pending command management finish);
- 0xFF Wrong format or size.

4.4.1.3 (0x36) - Authorization answer command

Authorization answer is always returned as reaction to previous Authorization request command (This is (0x34) - Lock command or (0x35) - Unlock command .with **b7** of **CMD_ID** field set to 1).

In Clover Net, it is received as normal request frame, without expecting application answer.

In LoRaWAN and Sigfox, it is received as downlink message (message following uplink frame).

It contains a copy of command forwarded for authorization in case of grant (size of requested for authorization command), or reject (1B).

In case of Sigfox, download message it contains only 8 byte, thus command format is reduced.

Message format in CloverNet and LoRaWAN DOWNLINK

FH		CMD	
0	1		n
0x36	1st B		1st B

CMD.....Copy of command that requires authorization;

0x00 Authorization rejected (size is 1 byte)

Any other.Command that receive authorization acceptance (size match to command size)

Message format in Sigfox DOWNLINK

FH	CMD_ID	USE	R_ID		Z@	
0	1	2	3	4		7
0x36		MSB	LSB	MSB		LSB

CMD_ID..... Operation that requested authorization:

b[7] ... Type of request:

- 0 Unlock operation
- 1 Lock operation

b[4:0] Copy of CMD_ID field from command that request authorization

USER_ID Copy of USER_ID field from command that request authorization

Z@.....Copy of Z@ field from command that request authorization

4.4.1.4 (0x37) - New Cable association command

Command for assigning new Cable ID. Once received, the cable ID is read and stored in EEPROM. After that <u>Event frame</u> "Cable replaced" with read ID is sent.

Request format

FH	USE	R_ID		
0	1 2			
0x37	MSB	LSB		

USER_ID......User Identification Number of the requester. This information will be inserted in the Cable replaced Event frame;

Reply format

FH	STATUS
0	1
OxB7	

STAT..... Status of request reception:

- 0x00...Request accepted;
- 0xF1 Bluetooth management disabled by <u>SFN_EN</u>. BLE request rejected;

0xFE...Seal check not enabled (parameter <u>SEAL_CHK</u> = 0). Request rejected; 0xFF...Wrong format or size.

4.4.1.5 (0x38) - Check Zone command

This command requests immediately to check Zone. After answering, request Zone service is started and after it finishes, <u>Event frame</u> "Zone Check info" is sent with information about current zone area state (parameter <u>ZON AREA</u>).

Request format

FH
0
0x38

Reply format

FH	STATUS
0	1
0xB8	

STAT..... Status of request reception:

- 0x00...Request accepted;
- 0xFD Zone Check RSSI mode in progress. Request rejected;
- 0xFE Zoning service disabled. Request rejected;
- OxFF... Wrong size. Request rejected.

4.4.1.6 (0x39) - Check Zone RSSI command

This command switch device to mode in which it continuously generates scanning windows and indicate RSSI signal strength (by LED) of received zone beacons.

Request format

FH		Z@		RSSI_DEL TIME TA		
0	1		4	5	6	
0x39	MSB		LSB			

Z@.....Zone beacon issuer address to watch for. If set to 0xFF...F all received zone beacons are accepted, but only the one with highest RSSI is indicated by LED;

RSSI_DELTA...... Threshold between GOOD and ACCEPTABLE zone beacon RSSI level. In dBm. Max. value of 20;

TIME......Time (in seconds) during which devcie will stay in this mode. If set to 0 devcie stop previously started mode for checking zone RSSI;

Reply format

FH	STATUS
0	1
0xB8	

STAT..... Status of request reception:

- 0x00...Request accepted;
- 0xFB Requested RSSI_DELTA too high. Request rejected;
- 0xFC Check zone RSSI mode already runing. Request rejected;
 - 0xFD Zone Check in progress. Request rejected;
- 0xFE Zoning service disabled or Zone Check RSSI command disabled by generic parameter **ZONE_CONF**, field **CONF**, bit **1**. Request rejected;
- 0xFF... Wrong size. Request rejected.

4.4.1.7 (0x2F) - Zone Beacon Incoming Message

Message is expected on channel defined by generic parameter **ZONE_CONF**, field **CH**, in window scanning mode with windows defined by field PER and with multicast address defined either by device general reception GRP (generic parameter **RCP_GRP** if bit 1 in **ZONE_CONF**, field **CONF** is set or field **GRP** in same parameter if bit 1 is cleared), in mode:

- FSK, 50kBps when bit **0** in generic parameter in **ZONE_CONF**, field **CONF** is set to "0";
- LoRa, SF7 when bit **0** in generic parameter in **ZONE_CONF**, field **CONF** is set to "1".

Zone Beacon Legacy Request format ($CZ \rightarrow CT$)

FH	ZIC	ZDS		I	EC		
0	1	2	3			6	
0x2F		EXIT_OFFSET (b7-6)	TSHL(b5-0)	NU	NU	NU	EENB

Zone Beacon Request format (CZ \rightarrow CT)

FH	ZIC	ZDS	EENB	
0	1	2	3	
0x2F		EXIT_OFFSET (b7-6)	TSHL(b5-0)	

Request field description:

ZIC – Zone Identification Code;

ZDS – Zone Detection Sensitivity:

- **b5-0 [TSHL] Threshold level** defines absolute threshold level for accepting/rejecting new discovered Zone beacons (Enter area). It is always negative and expressed as multiple of -2dBm (range from 0 to -126dBm).
- **b7-6 [EXIT_OFFSET] Exit offset** defines offset to absolute threshold level applied for detecting exit area. It is always negative and expressed as multiple of -5dBm (range from 0 to -15dBm).
- IEC Communication settings for Paired Backbone Address. IEC field codding depends from ZIC field value:

EENB – Number of Zon beacons to confirm for Enter/Exit detection:

b3-0 [ENTER] – Defines number of consecutive detections of new Zone beacons before consider device enters this area. Range from 1 (on first new beacon detection area is considered entered) to 15 (15 consecutive confirmation are needed to consider area is entered);

b7-4 [EXIT] – Defines number of consecutive missing of Zone beacons before consider device exits this area. Range from 1 (on first missing beacon area is considered exited) to 15 (15 consecutive missing Beacons are needed to consider area is exited).

Filtering threshold for new discovered Zone beacons (enter area) is calculated as:

Z@threshold = -(ZDS[THSL]*2) + RSSI_OFFSET;

Filtering threshold for missing Zone beacons (exit area) is calculated as:

Z@_{threshold} = -(**ZDS**[**THSL**]*2) + RSSI_OFFSET - (**ZDS**[**EXIT_OFFSET**]*5);

5 Battery replacement and initialization

5.1 Battery replacement

Replacing the battery requires to remove the front panel, but an open case security is detected if done without prior action.

To temporarily disable the open case feature, use (0x39) – Maintenance command with ACTION id 0x01. This disables the feature until the front panel is reassembled.



When the front panel is removed, this gives access to the anti-tamper battery flange. Unscrew the central screw in order to release the battery.

NOTE This screw also maintain the main body nested together. Make sure to do not un slot the 2 main parts of the body while this screw is removed.

Then, the battery can be pull off, and replaced by a new one.



Now, the flange can be reassembled by inserting the tooth at the bottom, and then put back the screw into place.

IMPORTANT These are screws for plastic: they are directly mounted in the plastic body. In order to preserve the threads while reassembling the screws, first engage them by hand, and then finish screwing using a screw driver (recommended tightening torque is 1.0Nm).

These are very specific screws. Do not attempt to replace them by other references; this will cause irreversible caising damages.

Before reassembling the front panel, make sur that the seal is correctly placed in the groove.

IMPORTANT An additional operation can be done when the new battery is in, in order to decare to device that it has to reinitialize its battery life counters from that moment. See <u>(0x39) – Maintenance</u> <u>command</u> for more information

NFC ID to be known/ given to NFC



5.2 Battery level initialization



LoRaWAN downlinks commands on port #1

Battery level initialization is done through a LoRaWAN downlink after replacing the batteryRequest150111040000000LoRaWAN answer uplink94011100

6 Parameters description

Since many parameters are linked to generic features like spontaneous sending, parameters are splitted into 2 different ranges.

- 0x01 to 0x7F are allocated to generic parameters
- 0x81 to 0xFF are allocated to applicative parameters

Parameter types according way of storing are:

- xxx-P..... Persistent parameters current value is stored in EEPROM and loaded on reset
- xxx-V Volatile on reset default parameter is loaded

Parameter types according way of access are:

- **RO-x**..... Read only parameters can be read, can't be modified
- RW-x Read/Write parameters can be read, can be written

6.1 APPLICATION parameters

Parameter types according way of storing are:

- **xxx-P** Persistent parameters current value is stored in EEPROM and loaded on reset
- xxx-V Volatile on reset default parameter is loaded
- **xxx-S** Signature Signature signed parameters
- **xxx-D** Battery Clear Parameters values are not affected on Load Default. Values are set to 0 on battery initialization

Parameter types according way of access are:

- **RO-x** Read only parameters can be read, can't be modified
- **RW-x** Read/Write parameters can be read, can be written
- **TRW-x** Time Slot Read/Write parameters can be read, can be written, updated on timeslot change. High and Low Time Slot parameters copies are accessed using service 0x01 commands 0x21/0x22 (Read/Write) for Low activities time slots and 0x23/0x24 (Read/Write) for High activities time slots



6.1.1 General parameters

ID	NAME	Size	Description		
0x80	APL_PAR_SGNT [RO-V]	4	Application Parameters Signature Parameter signature computed over all application parameters stamped xxx-S.		
			Default value: 0x00000000 (initialized at startup)		
0x81	SFN_EN [RW-PS]	2	Special Function Enable b15-5 [ro] Reserved; b5 [r/w] Encryption for all application commands and messages enabled; b4 [ro] Reserved; b3 [r/w] SHOCK_EN External Shock sensor supported; b2 [r/w] GPS_EN b1 [r/w] Bluetooth application command management enabled; b0 [r/w] NFC_EN b1 [r/w] NFC_EN b2 [r/w] NFC_EN		
0x82	FN_EN [TRW-PS]	2	Function Enable Allows to activate application services according Time Slots management or on special request: b15-13 [ro] - Reserved; b12 [r/w0]TAP_ENTAP management enabled; b11 [r/w0]EVT_ENTAP management enabled; b10 [r/w0]TAP_ENTAP management enabled; b12 [r/w0]TAP_ENTAP management enabled; b12 [r/w0]TAP_ENTAP management enabled; b11 [r/w0]EVT_ENEvent frame send management enabled; b10 [r/w0]ALR_ENAlarm frame send management enabled; b3 [r/w0]GPS_ENGPS localization enabled; b8 [ro] - Reserved; b7 [r/w0]REED_ENGPS localization enabled; b8 [ro] - Reserved; b6 [r/w0]MAG_ENMagnetometer management enabled; b5 [r/w0]MAG_ENMagnetometer management enabled; b5 [r/w0]MAG_ENMotion management enabled; b4 [r/w0]SHOCK_EN Shock management enabled; b3 [r/w0]MOT_ENMotion management enabled; b1 [r/w0]NFC_ENNFC management enabled; b0 [r/w0]LOCK_ENLock/Unlock management enabled; b0 [r/w0]LOCK_ENLock/Unlock management enabled; b0 [r/w0]LOCK3 (all are disabled)		
0x83	CLR_EN [RW-V]	1	Clear Counter Enable On write clears selected parameter (bits are self-cleared). Read always as 0. -b7-1 [ro] – Reserved -b0 [r0/w0] - LOCK_CLR – Clear LOCK NB parameter. Default value: 0x00		
0x84	LOG_EN [RW-PS]	2	Logging Enable b15 [r/w]BLE_ENBLE events; b14 [r/w]NFC_ENNFC events; b13 [r/w]ALR_ENAlarm management states; b12 [r/w]ALR_ENAlarm management states; b12 [r/w]AUTH_ENAuthorization events; b11 [r/w]SEAL_ENSeal events; b10 [r/w]LOCK_ENLock/Unlock events; b9 [r/w]LOCK_ENLock/Unlock events; b9 [r/w]LOC_ENLocation (Zoning, GPS) events; b7 [r/w]VS_ENVery special frame send event; b6 [r/w]TECH_ENTechnical frame send event; b5 [r/w]PEL_ENPeriodic event list frame send event; b4 [r/w]PEL_ENPeriodic data logging frame send event; b3 [r/w]REVT_ENEvent frame send event; b1 [r/w]PA_ENKeep alive frame send event; b1 [r/w]PAR_ENRevent frame send event; b1 [r/w]PAR_EN		



			ATTENTION – Battery resource expire, Temperature operational limits exceeded, Open Case detection, Lock/Unlock fail, Cable cut or removed while locked and Unread log events lost events are not maskable! Default value: 0x3F507 (ALR_EN AUTH_EN SEAL_EN LOCK_EN MOT_EN LOC_EN EVT_EN PAR_EN SYS_EN)
0x85	LED_NOT_PER [RW-PS]	4	LED Notification Configuration [B0 - MSB] LED blink period (in multiple of seconds). [B1] LED blink duration (in multiple of 50ms). [B2] Defines LED Color used for Normal LED Notification: - 0x01 - Green LED; - 0x02 - Red LED; - Any other - rejected. [B3 - LSB] Defines LED Color used for Critical LED Notification: - 0x01 - Green LED; - 0x02 - Red LED; - Any other - rejected. If any of these bytes is set to 0 LED blinking is disabled. Default value: 0x05020102 (5sec period, 100ms duration, green and red)
0x86	BCONF_STAT [RO-V]	1	Bad Configuration Status b7-2 [ro]Reserved b1 [ro]CON_FAIL. Connection with higher level failed b0 [ro]TS_FAIL Timeslot initialization failed Default value: 0x00 (all is OK)
0x87	SENS_STAT [RO-P]	2	<pre>Sensor Status b15[ro] Reserved; b14 [ro] GPS GPS State (1-Error, 0-OK/Not used); b13 [ro] EVT_OVF Events lost (event queue overflow); b12 [ro] EVT_ERR Event not send or lost due to configuration problems; b11:10 [ro] BLE Bluetooth State; -00 (0) - Disabled; -01 (1) - Initialized, advertising (not connected); -10 (2) - Connected; -11 (3) - Error. b9 [ro] .NFC NFC State (1-Error, 0-OK/Not used); b8 [ro] .MAG Magnetometer State (1-Outside thresholds, 0-Within thresholds/Not used); b8 [ro] .MAG Magnetometer State (1-Outside thresholds, 0-Within thresholds/Not used); b5 [ro] .TILT Tilt State (1-IIIted, 0-Not Tilted/Not used); b6 [ro] .MOT Motion State (1-Motion, 0-No Motion/Not used); b5 [ro] .REED State of Reed relay (1-Active (Closed), 0-Idle (Opened) /Not used); b5 [ro] .SEAL State of Seal (Cable): -00 (0) - Inserted; -10 (2) - ID not recognized (Cut/Short/Error); -11 (3) - Checks Disabled. b1:0 [ro] .LOCKState of Lock mechanism: -00 (0) - Unlocked; -10 (2) - Error. Default value: 0x0000 (all is OK)</pre>



6.1.2 Events management parameters

ID	NAME	Size	Description
0x88		2	Event Detection Status When one of these events occurs, the corresponding bit is set and LED starts blinking according to <u>LED NOT PER</u> if enabled in <u>EVT LED EN</u>). Note: Despite this parameter is defined as RO, by writing "1" in bits of this parameter events can be cleared. When all bits are cleared (except b9) LED blinking stops. b15 [r/w0]TAPTAP activity detected; b14 [r/w0]DI_RD2 Reed relay stage 2 detected; b13 [r/w0]TAMPER. Open Case detected; b12 [r/w0]TEMPTemperature limit reached detected; b11 [r/w0]ZEXIT
	EVT_STAT [RO-V]		 b11 [r/w0]ZENT Zone Continuous detected; b9 [r/w0]ZENT Zone Enter detected; b8 [r/w0]SEAL Seal state change detected; b7 [r/w0]LOCK Lock Request detected; b6 [r/w0]UNLOCK Unlock Request detected; b5 [r/w0]MAG Magnetic field (tamper/magnet) change detected; b4 [r/w0]SHOCKShock detected; b3 [r/w0]SHOCK Tilt detected; b2 [r/w0]MSTOP Motion stop detected;
			b1 [r/w0]MCONT. Motion continuous detected; b0 [r/w0]MSTART . Motion start detected.
			Deraoli value: 0x0000 (norming defected)
0x89	EVT_LED_EN [RW-PS]	2	 Normal Event LED Notification Enable When one of these events occurs, the LED starts blinking (according LED NOT PER B2 settings) until EVT_STAT writing to any value is attempted (it will erase it and stop LED blink). Parameter <u>CRIT LED EN</u> has priority over these settings! b15 [r/w] TAPLED blinking on TAP enabled; b14 [r/w] DL_RD2LED blinking on Qpen Case enabled; b13 [r/w] TAMPERLED blinking on Zone Case enabled; b11 [r/w] ZEXITLED blinking on Zone Exit enabled; b10 [r/w] ZCONTLED blinking on Zone Enter enabled; b8 [r/w] SEALLED blinking on Lock Request enabled; b6 [r/w] UNLOCKLED blinking on Magnetic field (tamper/magnet) change enabled; b5 [r/w] SHOCKLED blinking on Shock detection enabled; b3 [r/w] MAGLED blinking on Motion stop detection enabled; b1 [r/w] MATOPLED blinking on Motion continuous detection enabled; b2 [r/w] MATOPLED blinking on Motion start detection enabled; b3 [r/w] MATOPLED blinking on Motion start detection enabled;
			Critical Event LED Notification Enable
0x8A	CRIT_LED_EN [RW-PS]	2	 when one of these events occurs, the LED starts blinking (according LED NOT PER B3 settings) until EVT STAT writing to any value is attempted (it will erase it and stop LED blink). This parameter has priority over EVT LED EN. b15 [r/w] TAPLED blinking on TAP enabled; b14 [r/w] DI_RD2LED blinking on Reed relay stage 2 enabled; b13 [r/w] TAMPERLED blinking on Open Case enabled; b12 [r/w] TEMPLED blinking on Temperature limit reached enabled; b11 [r/w] ZEXITLED blinking on Zone Exit enabled; b10 [r/w] ZCONTLED blinking on Zone Continuous enabled;
			b9 [r/w]ZENTLED blinking on Zone Enter enabled;



			b8 [r/w] SEALLED blinking on Seal state change enabled;
			 b7 [r/w]LOCKLED blinking on Lock Request enabled; b6 [r/w]UNLOCK.LED blinking on Unlock Request enabled; b5 [r/w]MAGLED blinking on Magnetic field (tamper/magnet) change enabled; b4 [r/w]SHOCKLED blinking on Shock detection enabled; b3 [r/w]TILTLED blinking on Tilt detection enabled; b2 [r/w]MSTOPLED blinking on Motion stop detection enabled; b1 [r/w]MCONTLED blinking on Motion continuous detection enabled; b0 [r/w]MSTARTLED blinking on Motion start detection enabled.
			Event Logging Enable
			When one of these events occurs, it is logged in event log table if the corresponding bit is set b15 [r/w] TAPLog event on TAP enabled; b14 [r/w] DL_RD2Log event on Reed relay stage 2 enabled; b13 [r/w] TAMPERLog event on Open Case enabled; b12 [r/w] TEMPLog event on Temperature limit reached enabled; b11 [r/w] TEMPLog event on Temperature limit reached enabled;
۵۷۹۵	EVT_LOG_EN	2	 b11 [r/w] ZEXIILog event on Zone EXIT enabled; b10 [r/w] ZCONTLog event on Zone Continuous enabled; b9 [r/w] ZENTLog event on Zone Enter enabled; b8 [r/w] SEALLog event on Seal state change enabled;
UXOD	[RW-PS]	2	 b7 [r/w] LOCKLog event on Lock Request enabled; b6 [r/w] UNLOCK.Log event on Unlock Request enabled; b5 [r/w] MAGLog event on Magnetic field (tamper/magnet) change enabled; b4 [r/w] SHOCKLog event on Shock detection enabled; b3 [r/w] TILTLog event on Tilt detection enabled; b2 [r/w] MSTOPLog event on Motion stop detection enabled; b1 [r/w] MCONT .Log event on Motion continuous detection enabled; b0 [r/w] MSTARTLog event on Motion start detection enabled.
			Event CPS League English
0x8C	EVT_GPS_EN [RW-PS]	2	When one of these events occurs, GPS Location check is processed if the corresponding bit is set. b15 [r/w] TAP GPS location on TAP enabled; b14 [r/w] DI_RD2 GPS location on Reed relay stage 2 enabled; b13 [r/w] TAMPER GPS location on Open Case enabled; b12 [r/w] TEMP GPS location on Temperature limit reached enabled; b11:9 [ro] Reserved; b8 [r/w] SEAL GPS location on Seal state change enabled; b7 [r/w] LOCK GPS location on Lock Request enabled; b5 [r/w] UNLOCK .GPS location on Magnetic field (tamper/magnet) change enabled; b4 [r/w] SHOCK .GPS location on Spock detection enabled;
			 b3 [r/w] TILTGPS location on Tilt detection enabled; b2 [r/w] STOPGPS location on Motion stop detection enabled; b1 [r/w] CONTGPS location on Motion continuous detection enabled; b0 [r/w] MSTARTGPS location on Motion start detection enabled. Default value: 0x0000 (all disabled)
			Event Frame Sending Enable
			When one of these events occurs, an Event frame is sent (according the current Event frame settings) if the corresponding bit is set
0x8D	EVT_SEND [RW-PS]	2	 b15 [r/w] TAPEvent send on TAP enabled; b14 [r/w] DI_RD2Event send on Reed relay stage 2 enabled; b13 [ro] Not usedOpen Case events are always enabled; b12 [r/w] TEMPEvent send on Temperature limit reached enabled;
			b11 [r/w] ZEXIT Event send on Zone Exit enabled;



			 b10 [r/w] ZCONTEvent send on Zone Continuous enabled; b9 [r/w] ZENTEvent send on Zone Enter enabled; b8 [r/w] SEALEvent send on Seal state change enabled;
			 b7 [r/w]. LOCKEvent send on Lock Request enabled; b6 [r/w]. UNLOCK.Event send on Unlock Request enabled; b5 [r/w]. MAGEvent send on Magnetic field (tamper/magnet)
			b4 [r/w] SHOCK Event send on Shock detection enabled;
			 b3 [r/w] TILTEvent send on Tilt detection enabled; b2 [r/w] MSTOPEvent send on Motion stop detection enabled; b1 [r/w] MCONTEvent send on Motion continuous detection enabled; b0 [r/w] MSTARTEvent send on Motion start detection enabled.
			Default value: 0x51C0 (DI_RD2 TEMP SEAL LOCK UNLOCK)
			 Alarm Frame Sending Enable When events happens and it is enabled by ALR_SEND (and EVT_SEND), new Event frame is send(according the current Event frame settings) on every ALR PER time until corresponding bit in parameter EVT_STAT is cleared. b15 [r/w] TAP Alarm send on TAP (Event 0x94 00) enabled; b14 [r/w] DI_RD2Alarm send on Reed relay stage 2 (Event 0x85 00)
	ALR SEND		enabled; b13 [r/w] TAMPER Alarm send on Open Case (Event <u>0x86 00</u>) enabled; b12 [r/w] TEMP Alarm send on Temperature limit reached (Event <u>0x84</u> <u>0x</u>) enabled;
			 b11 [r/w] ZEXITAlarm send on Zone Exit (Event 0x87 02) enabled; b10 [r/w] ZCONTAlarm send on Zone Continuous (Event 0x87 01) enabled; b9 [r/w] ZENTAlarm send on Zone Enter (Event 0x87 00) enabled; b8 [r/w] SEALAlarm send on Seal Cut/Removed while device is Locked (Event 0x92 03) enabled;
UX8E	[RW-PS]	2	 b7 [r/w] LOCKAlarm send on Lock Fail (Event 0x90 0B) enabled; b6 [r/w] UNLOCKAlarm send on Unlock Fail (Event 0x91 07) enabled; b5 [r/w] . MAGAlarm send on Magnetic field (tamper/magnet) Out of reference detection (Event 0x83 00) enabled; b4 [r/w] SHOCK Alarm send on Shock detection (Event 0x81 00) enabled;
			 b3 [r/w] TILT
			b1 [r/w] MCONTAlarm send on Motion continuous detection (Event
			b0 [r/w]MSTART Alarm send on Motion start detection (Event <u>0x80 00</u>) enabled.
			Default value: 0x21C0 (Alarm sending on Tamper, Cable cut or removed while device is locked and Lock/Unlock Fail are enabled)
			Alarm Sending Period
	ALR PFR		Period of repeating alarms selected by parameter <u>ALR_SEND</u> .
0x8F	[RW-PS]	2	Max. period is 4320 minutes (72 hours/3 days – 0x10E0)
			Default value: 0x003C (60 minutes)

6.1.3 Lock/Unlock/Seal parameters

ID	NAME	Size	Description
0x90	ZIC_LOCK [RW-PS]	2	 Beacon ZIC Lock/Unlock Mask Bit field that defines which accepted beacon ZIC disable Lock/Unlock management. b15 [r/w]ZIC 240÷255.enable Lock/Unlock management; b14 [r/w]ZIC 224÷239.enable Lock/Unlock management; b13 [r/w]ZIC 192÷207.enable Lock/Unlock management; b11 [r/w]ZIC 176÷191.enable Lock/Unlock management; b10 [r/w]ZIC 160÷175.enable Lock/Unlock management; b9 [r/w]ZZIC 144÷159.enable Lock/Unlock management; b8 [r/w]ZIC 112÷127.enable Lock/Unlock management; b7 [r/w]ZIC 112÷127.enable Lock/Unlock management; b6 [r/w]ZIC 112÷127.enable Lock/Unlock management; b5 [r/w]ZIC 64÷79enable Lock/Unlock management; b5 [r/w]ZIC 64÷79enable Lock/Unlock management; b5 [r/w]ZIC 48÷63enable Lock/Unlock management; b3 [r/w]ZIC 16÷31enable Lock/Unlock management; b1 [r/w]ZIC 16÷31enable Lock/Unlock management; b1 [r/w]ZIC 16÷31enable Lock/Unlock management; b0 [r/w]ZIC 0÷15enable Lock/Unlock management;
			Default value: 0xFFFF (No inhibition)
0x91	LOCK_ECFG [RW-PS]	2	Lock Event Configuration – Event generation on different type of Lock results configuration: b15 [r/w]. AUTH_REQ Authorization before Lock required; b14 [r/w]. ZON_BF_REQ Location (zoning) check before Lock; b13-12 [ro]
0x92	UNLOCK_ECFG [RW-PS]	2	 Unlock Event Configuration – Event generation on different type of Unlock results configuration. b15 [r/w]. AUTH_REQ Authorization before Unlock required; b14 [r/w]. ZON_BF_REQ Location (zoning) check before Unlock; b13-12 [ro]
	AUTH ECFG		Authorization Events Configuration – Defines which Lock/Unlock authorization will
0x93	[RW-PS]	1	generate events. b7-4 [ro] . Reserved



			 b3 [r/w] AUTH_OK Event on authorization confirmed (request granted); b2 [r/w] AUTH_REJ Event on authorization not confirmed (request rejected); b1 [r/w] DEC Event on Decryption error (request rejected); b0 [r/w] VDATE Event on Validity Date expired (request rejected). Default value: 0x0F (all is enabled)
0x94	SEAL_ECFG [RW-PS]	1	 Seal (Cable) Event Configuration - Defines which seal state changes will generate events, that set bit SEAL in EVT_STAT parameter. b7 [r/w] LEDLED indication on Cable Insert or Removed; b6-5 [ro]Reserved b4 [r/w] REM_ALRSeal (Cable) removed while cable was locked - Alarm; b3 [r/w] ID_ALRSeal (Cable) ID not read while cable was locked - Alarm; b2 [r/w] ID_ERRSeal (Cable) ID not read while cable was not locked; b1 [r/w] REMSeal (Cable) inserted. Default value: 0x9F (all is enabled)
0x95	SEAL_CHK [RW-PS]	1	Seal (Cable) Check time Defines time (in seconds) for checking Cable ID and state (present/removed). If set to 0 check is disabled. Default value: 0x02 (checked every 2 seconds)
0x96	SEAL_ID [RO-V]	8	Seal (Cable) ID Dallas ID chip serial number. Default value: Not applicable (0 if cable ID is not read)
0x97	AUTH_TO [RW-PS]	1	Authorization Timeout Defines time for waiting authorization answer after request to upper level was send in seconds. Value 0 is forbidden (rejected). Default value: 0x0A (10s Authorization timeout)
0x98	LOCK_NB	2	Number of lock cycle Counter indicating the number of Lock/unlock done. Cleared by writing bit LOCK_CLR in parameter CLR EN. Default value: 0x00000000 (initialized at startup)



6.1.4 Other parameters

ID	NAME	Size	Description
0x99	NFC_TO [RW-PS]	1	 NFC Session Timeout Defines time (in seconds) for terminating NFC Exchange Command session if no new command appears. -0 - No confirmation on device answer is waited and fixed time of 10s is set for waiting new NFC command (legacy SW mode); -1 - disabled value; -2-255 - time in seconds for waiting answer read confirmation and new NFC command (after answer read confirmation is received). Default value: 0x14 (Terminate NFC session after 20 seconds)

6.2 **GENERIC** parameters default values

NOTE Refer to CloverCore Generic Specification [DR01].

Here below are the default values applied to some generic parameters, but they are not described here (refer to [DR01]).

All other generic parameter values are as described by [DR01].

Param ID	Name	Size	Description	
0x07	INST_MODE [RW-PS]	4	Installation modes b31Blind (no com with distant equipment, join procedures still executed) b30-13 reserved b12Sigfox b11-9 reserved b8 LoRaWAN b7-6 reserved b5 Clover-Net BCT bit field by order (ordo ID 1 is used) b4 Clover-Net BCT b3 Clover-Net MCT b2 Clover-Net P2P with BCT search (distant equipment research) b1 Clover-Net P2P Default value: 0x80000100 (Blind mode, LoRaWAN)	
0x22	EVT_TYPE [RW-PS]	1	Event frame type 0x00 Disabled 0x01 Short event frame 0x02 Standard event frame 0x03 Long event frame 0x04 Special event frame Default value: 0x02 (Standard frame)	
0x23	EVT_MODE [RW-PS]	1	Event frame sending mode 0x00 Clover-Net P2P 0x01 Clover-Net MCT - no ACK 0x02 Clover-Net MCT - ACK 0x03 Clover-Net BCT - no ACK 0x04 Clover-Net BCT - ACK 0x05 Clover-Net Extender service - no ACK 0x06 Clover-Net Extender service - ACK 0x07 LoRaWAN unconfirmed 0x08 LoRaWAN confirmed 0x08 LoRaWAN confirmed 0x09 Sigfox - no ACK 0x0A Sigfox - ACK	
0x25	EVT_REP [RW-PS]	1	Event frame first sending random delay rang Applied on the 1st frame sending only. Random delay computed in range from min to max: [1st byte] minimum, expressed in [seconds], value <= max [2nd byte] maximum, expressed in [seconds], min <= value NOTE: for repetition delay, see params CNET_DELn_RNG and OTHER_DELn_RNG Default value: 0x0000 (immediate sending)	

CONFIDENTIAL – Do not distribute without prior written agreement



0x28	KA_TYPE [RW-PS]	1	Keep-Alive frame default type0x00 Disabled0x01 Short Keep-Alive frame0x02 Standard Keep-Alive frame0x04 Special Keep-Alive frameDefault value: 0x02 (Standard frame)			
0x29	KA_MODE [RW-PS]	1	Keep-Alive frame sending mode 0x00 Clover-Net P2P 0x01 Clover-Net MCT - no ACK 0x02 Clover-Net MCT - ACK 0x03 Clover-Net BCT - no ACK 0x04 Clover-Net BCT - ACK 0x05 Clover-Net BCT - ACK 0x06 Clover-Net Extender service - no ACK 0x07 LoRaWAN unconfirmed 0x08 LoRaWAN confirmed 0x09 Sigfox - no ACK 0x04 Sigfox - ACK			
0x2B	KA_REP [RW-PS]	1	Keep-Alive frame repetition number Applied whatever the sending mode is. Repetitions stop if ACK/confirmation is received. Corresponds to the number of sendings, not only repetitions). Max value: 10 Default value: 0x01 (1 frame sent))			
0x3F	TECH_TYPE [RW-PS]	1	Technical frame default type Default value: 0x01 (Short Technical frame sent)			
0x40	TECH_MODE [RW-PS]	1	Technical frame sending mode 0x00 Clover-Net P2P 0x01 Clover-Net MCT - no ACK 0x02 Clover-Net MCT - ACK 0x03 Clover-Net BCT - no ACK 0x04 Clover-Net BCT - ACK 0x05 Clover-Net Extender service - no ACK 0x06 Clover-Net Extender service - ACK 0x07 LoRaWAN unconfirmed 0x08 LoRaWAN confirmed 0x08 LoRaWAN confirmed 0x09 Sigfox - no ACK 0x0A Sigfox - ACK			
0x42	TECH_REP [RW-PS]	1	Technical frame repetition number Applied whatever the sending mode is. Repetitions stop if ACK/confirmation is received. Corresponds to the number of sendings, not only repetitions). Max value: 10 Default value: 0x01 (1 frame sent)			

7 Appendix C: Internal Log Events

Application part of event has following structure:

7.1 Event Log frame structure

	RTC			ELT_CNT		EVT		TED	
0		3	4		7	8	9		12
MSB		LSB	MSB		LSB		MSB		LSB

RTC...... Timestamp of log event (in Ineo Sense RTC format – typically number of seconds since 01.01.2010 00:00:00);

ELT_CNT..... Event log table counter;

EVT..... Event type (see Logged Event Types);

TED Type Event Data – additional information to current Event type.

7.2 LOG_EN description

See <u>LOG_EN</u> for more details.

Battery resource expires, Temperature operational limits exceeded, Open Case detection, Lock/Unlock fail, Cable cut or removed while locked and Unread log events lost events cannot be masked!

7.3 Logged Event Types

EVT	Event type	LOG EN bits	TED
0x01	Power Up/Restart	SYS_EN	 <u>Source (1B)</u>. Second byte defines source of Reset in more details: 0x00 - Restart requested by Application Command; 0x01 - Restart requested by Stack. 0x02 - Restart because of Power Up, Hard Fault or reset. <u>Type (1B)</u>: 0x00 - Restart because of Power Up; 0x01 - Restart because of Hard Fault or reset. 0x02 - Restart because of FOTA.
0x02	Clear Log/Parameters	SYS_EN	 Source (1B): 0x10 - Log reinitialized due to Log error; 0x11 - Log reinitialized due to CLR_MGT request; 0x30 - Parameters set to default requested by stack; 0x31 - Parameters set to default requested by Reed Relay on Power Up; 0x32 - Parameter cleared due to CLR_EN request. Clear Requested, bit codded (1B) according to Source: b0 (0x01) - Clear None Periodic Table (Log Table 0);



			 b1 (0x02) - Clear Periodic Table (Log Table 1); b2 (0x04) - Clear Generic Parameters; b3 (0x08) - Clear Application Parameters;
0x03	Log Event Records Lost	Unmaskable!	
0x04	Parameterization	PAR_EN	Target (1B): - 0x00 – Generic Parameters Update; - 0x01 – Application parameters Update; Affected Services, bit codded (1B):
0x05	RTC update	SYS_EN	Old RTC value (4B)
0x06	Time Slot Change	SYS_EN	New Time slot (1B): - 0x00 – Low Time Slot; - 0x01 – High Time Slot;
0x07	Standby Mode	SYS_EN	<u>Standby New State (1B):</u> - 0x00 – Exit Standby; - 0x01 – Enter Standby;
0x08	Resource Usage	Unmaskable!	
0x09	Temperature Alert	Unmaskable!	 New Temperature State (1B): 0x00 - Temperature within operating range; 0x01 - Temperature above operating range; 0x02 - Temperature bellow operating range. Measured Temperature (2B, signed integer in format Q8.8)
0x0A	Reed State Change	SYS_EN	New Reed Relay State (1B):- 0x00 - Reed Relay Released;- 0x01 - Reed Relay Activated;- 0x02 - Reed Relay Stuck;- 0x03 - Reed Relay Stuck Released;
0x0B	Zon Enter	LOC_EN	<u>Zon @ (4B)</u>
0x0C	Zon Stay	LOC_EN	<u>Zon @ (4B)</u>
0x0D	Zon Exit	LOC_EN	<u>Zon @ (4B)</u>
0x0E	GPS Fix	LOC_EN	Time since acquisition start to acquire fix in seconds (2B)
0x0F	GPS No Fix	LOC_EN	 Info: OxFFFF - GPS exit because of <u>GPS_ACQ_TOUT</u> expire; OxAAAA - GPS full reinitialization because of unexpected GPS activity found on Rx line, while GPS must be in Back Up mode; OxBBBB - GPS full reinitialization because Back Up command failed; Any other < 0x8000 - GPS lost fix after it was acquired (time in seconds after GPS acquisition started).
0x10	GPS Latitude	LOC_EN	Latitude coordinate after successful fix (4B float)
0x11	GPS Longitude	LOC_EN	Longitude coordinate after successful fix (4B float)
0x12	Event Detected	EVT LOG EN bits	Event type (1B) - 0x00 - Motion Start; - 0x01 - Motion Continues; - 0x02 - Motion Stop; - 0x03 - Tilt; - 0x04 - Shock; - 0x05 - Heading change; - 0x06 - Unlock; - 0x07 - Lock; - 0x08 - Cable; - 0x09 - Zone Enter; - 0x08 - Zone Stay; - 0x08 - Zone Stay; - 0x08 - Zone Exit; - 0x00 - Temperature; - 0x00 - Temperature; - 0x00 - Temperature; - 0x00 - Temperature; - 0x00 - Reed Relay Stage 2. Event info (1B) - according EVT_INFO field in Event frame, when applicable.
	Default		

CONFIDENTIAL – Do not distribute without prior written agreement



0x14	Installation Status/Result	SYS_EN	 Installation Status (1B): 0x00 – Installation started; 0x01 – Installation finished with Success; 0x02 – Installation failed; 0x03 – Installation requested from Reed Relay rejected (because of 8 hour delay on Standby). DEV_STAT MSB (1B). INST_MODE, bits 31,14-8 (1B). INST_MODE, bits 7-0 (1B).
0x15	Alarm	ALR_EN	Alarm Event Type (1B); Alarm Event Info (1B); Current Active Alarm event types (2B) – bits correspond to ALR SEND bits description;
0x16	Motion State Change	MOT_EN	 New Motion State (1B) 0x00 - Motion Start; 0x01 - Motion Start Event (with respect of START_DELAY); 0x02 - Motion Continuous Event (with respect of CONT_DELAY); 0x03 - Motion Stop; 0x04 - Motion Stop Event (with respect of STOP_DELAY);
0x17	Tilt State Change	MOT_EN	 New Tilt State (1B) 0x00 - Tilt Detected; 0x01 - Tilt Detected Event (with respect of OUT_REF_DEL); 0x02 - Tilt Restored; 0x03 - Tilt Restored Event (with respect of IN_REF_DEL)
0x18	Shock State Change	SHOCK_EN	
0x19	Open Case State Change	Unmaskable!	New Open Case State (1B) - 0x00 - Case closed; - 0x01 - Case open;
0x1A	Magnetic State Change	MOT_EN	 New Heading State (1B) 0x00 - Magnetic field change Detected; 0x01 - Magnetic field Change Event (with respect of OUT_REF_DEL) 0x02 - Magnetic field Restored; 0x03 - Magnetic field Restored Event (with respect of IN_REF_DEL)
Ox1B	MEMS Reference	MOT_EN	New Reference set to MEMS (accelerometer and magnetometer). <u>Reauest Source (1B)</u> - 0x00 – New reference requested by command 0x18; - 0x01 – New reference requested after Installation.
0x1C	Production integration State	SYS_EN	 Production Integration State Change (1B) 0x00 – Production Integration Test Started; 0x01 – Production Integration Finished with Timeout (Production Integration state not changed); 0x02 – Production Integration Finished Successfully (Production Integration state changed to Production Finished OK);
0x1D	NFC	NFC_EN	 NFC event (1B) 0x00 – NFC session Started; 0x01 – NFC session Finished; 0x02 – NFC command received. Only in this case next byte is FH of received command; 0xFE – NFC communication (I2C) error; 0xFF – NFC initialization error;
Ox1E	TAP state	EVT LOG EN bit TAP	 <u>TAP State (1B):</u> 0x00 - TAP service start; 0x03 - Wrong Code - TAP service still active; 0x04 - Process finished with error. Second byte defines it: 0x00 - TAP already running ???; 0x01 - Invalid RTC; 0x02 - Max. number of wrong codes reached; 0x03 - Timeout; 0x04 - Max. value for first digit exceeded;



			 0x05 - TAP running, but stopped by parameter change. 0x05 - Code accepted. Second byte defines what: 0x01 - Code 1 validated; 0x02 - Code 2 validated; 0x03 - Master Code validated.
0x1F	BLE	BLE_EN	 Ox00 - BLE initialized and ready; Ox01 - BLE reset. Critical issue; Ox04 - BLE connected; Ox05 - BLE disconnected;
0x20	Event Frame Send	EVT_EN	 Event Type (1B) - correspond to EVT_TYPE field of Event frame sent; Event Info (1B) - correspond to EVT_INFO field of Event frame sent; Status of Event Frame Request result (1B): 0x00 - Accepted; 0x01 - Accepted, frame from same group canceled; 0xD2 - Failed, no acknowledge after all retries; 0xD3 - Failed, no BCT answer after all retries; 0xD5 - Failed, not connected to network; 0xD6 - Failed, core remove event from queu by some reason; 0xEB - Rejected, size doesn't fit to Event Type; 0xED - Rejected, rame requested from ISR; 0xEE - Rejected, frame requested from ISR; 0xEF - Rejected, OTOTX service not initialized; 0xFx - Rejected, OTOTX error.
0x21	Event Frame Abandoned	EVT_EN	Event Type Frame abandoned, bit codded (4B): - b0 (0x00001) - Temperature above limit; - b1 (0x00002) - Temperature bellow limit; - b2 (0x000004) - Motion Start; - b3 (0x000008) - Motion Continue; - b4 (0x000010) - Motion Stop; - b5 (0x000020) - Tilt; - b6 (0x000040) - Shock; - b7 (0x000080) - Heading Change; - b8 (0x000100) - Event Send Timeout; - b9 (0x000200) - Reed Relay Stage 2;
0x22	Periodic Picture Frame Send	PP_EN	 B10 (0x000400) – Reed Keldy Stuck; PP. TYPE (1B). PP. MODE (1B). PP. PER (2B)
0x23	Periodic Data Logging Frame Send	PDL_EN	<u>PDL TYPE (1B).</u> <u>PDL MODE (1B).</u> <u>PDL PER (2B)</u>
0x24	Periodic Event List Frame Send	PEL_EN	P <u>el_type (1B),</u> <u>Pel_mode (1B),</u> <u>Pel_per (2B)</u>
0x25	Periodic Keep Alive Frame Send	KA_EN	<u>Ka type (1b),</u> <u>Ka mode (1b),</u> <u>Ka per (2b)</u>
0x26	Very Special Frame Send		<u>VS_TYPE (1B),</u> <u>VS_MODE (1B),</u> <u>VS_PER (2B)</u>
0x27	Event Frame Lost	Unmaskable!	Lost Event Type (1B), Lost Event Info (1B) * This is only first event lost. Next will not be marked until buffer for sending evens is not cleared.



eo-sense ing sense to wireless Error! Use the Home tab to apply Sous-titre to the text that you want to appear here. Error! Use the Home tab to apply Titre 1 to the text that you want to appear here.

0x28 0x29	Lock OK Lock Rejected	LOCK_EN	Lock Type (1B): - 0x00 - Adjustable Lock, Cable present; - 0x01 - Adjustable Lock, Cable not present; - 0x02 - Full Lock; - 0x03 - Already Locked, Cable present; - 0x04 - Already Locked, Cable not present; - 0x05 - Auto Lock, Cable present; - 0x06 - Auto Lock, Cable not present. USER ID (2B) Lock Type (1B):
			 0x00 - Validity date expire; 0x03 - Zoning requested, but Zone service disabled; 0x04 - Cable not present (when is required); 0x05 - Cable cut.
0x2A	Lock Failed	Unmaskable!	Lock Type (1B): - 0x00 – Locking mechanism not detect lock; <u>USER_ID (2B)</u>
Ox2B	Unlock OK	LOCK_EN	Lock Type (1B): - 0x00 – Unlock, Cable present; - 0x01 – Unlock, Cable not present; - 0x02 – Already Unlocked, Cable present; - 0x03 – Already Unlocked, Cable not present; <u>USER ID (2B)</u>
0x2C	Unlock Rejected	LOCK_EN	Lock Type (1B): - 0x00 – Validity date expire; - 0x03 – Zoning requested, but Zone service disabled. <u>USER ID (2B)</u>
0x2D	Unlock Failed	Unmaskable!	Lock Type (1B): - 0x00 – Locking mechanism not detect unlock; <u>USER_ID (2B)</u>
0x2E	Seal State Change	SEAL_EN	 <u>Seal State Change Type (1B):</u> 0x00 - Cable inserted. Next 2B define number of pulses detected on first and second check; 0x01 - Cable removed. Next 2B define number of pulses detected on first and second check; 0x02 - Cable cut while device is unlocked; 0x03 - Cable replaced. Only in this case <u>USER 1D (2B)</u> is added.
0x2F	Seal Alarm	Unmaskable!	 <u>Seal State Change Type (1B):</u> 0x00 – Cable removed while device is locked; 0x01 – Cable cut while device is locked;
0x30	Decryption Error	AUTH_EN	<u>Command FH (1B):</u> <u>USER_ID (2B) if present.</u>
0x31	Authorization request	AUTH_EN	Command FH (1B): USER ID (2B) if present. Authorization type (1B): - 0x00 – Authorization requested by command; - 0x01 – Authorization requested because of AUTH_REQ set in corresponding to operation <u>xxxx_ECFG</u> parameter;
0x32	Authorization answer	AUTH_EN	Command FH (1B): USER ID (2B) if present. Authorization type (1B): - 0x00 – Authorization grant; - 0x01 – Authorization reject; - 0x02 – Authorization timeout;
0x33	PIN Code Change	PAR FN	Parameter CN PIN CD changed

All TED data is left aligned, without spare bytes between data fields and padded with 0 to the end.



8 Appendix G: Generic Zone Configuration parameters

Zoning service can be activated by setting bit b9 in GFN EN.

Param ID	Name	Size	Description
0x78 TABLE 1	ZONE_CONF [RW-PS]	7	 Zoning configuration [1 byte] CONF - Configuration bits b7-2 unused b1Enable Zone Check RSSI command execution b0LoRa SF6 500KHz beacons when set, else FSK 50KHz [1 byte] CH - Beacons channel When LoRa SF6 is selected, channels are cast to 1 to 5 range automatically [1 byte] PER - Beacons period Expressed in [s]. Minimum 1s. Maximum 5s. This parameter defines how wide will be scanning windows. It must be higher than transmitted beacons period so a margin is automatically managed [1 byte] GRP - Beacons multicast group Used to filter Zone beacons by their multicast group [1 byte] RSSI - Beacons RSSI offset Signed value, expressed in [dB]. RSSI offset added to measured RSSI of received beacon. Result of this addition is compared with RSSI thresholds delivered by zone beacon itself [2 bytes] ZCHK_TIME - Zone check time Expressed in [s]. Time for checking zone areas if there is no other request for checking. This time is loaded after every check and if during this time there is no request for zone check it generates such request. 0 value is rejected.



0x79 TABLE 1	ZONE_EN [RW-PS]	4	 Event Zone Location Enabler When one of these events occurs, Zone Location check is processed if the corresponding bit is set. //====== APPLICATION MANAGED====================================
0x7A TABLE 1	ZONE_ZIC_EVT [RW-PS]	6	 ZIC Zone Events Masks [2 bytes] ZIC_ENTER - Zone entering events sending Every bit represents 16 zone beacon ZIC values (b0->0-15, b1->16-31,). When set it allows generating ENTER events for zone beacons with this ZIC. ENTER events are generated only when zone beacon detected in this check was not detected in previous one [2 bytes] ZIC_EXIT - Zone exiting events sending Every bit represents 16 zone beacon ZIC values (b0->0-15, b1->16-31,). When set it allows generating EXIT events for zone beacons with this ZIC. EXIT events are generated only when zone beacon was detected in previous check and this zone beacon was detected in previous check and this zone beacon was not detected in this slot. It is possible to have simultaneous events EXIT and ENTER in single check when one zone beacon replaces other between 2 checks [2 bytes] ZIC_STAY - Zone staying events sending Every bit represents 16 zone beacon ZIC values (b0->0-15, b1->16-31,). When set it allows generating STAY events for zone beacons with this ZIC. STAY events are generated only when zone beacon detected in previous check is still available in current check. If on previous check no zone was detected and in this one also no zone beacon is detected STAY event is not generated



CONFIDENTIAL – Do not distribute without prior written agreement